

BIM Wiki – Basic Square Foot Estimating

Purpose:

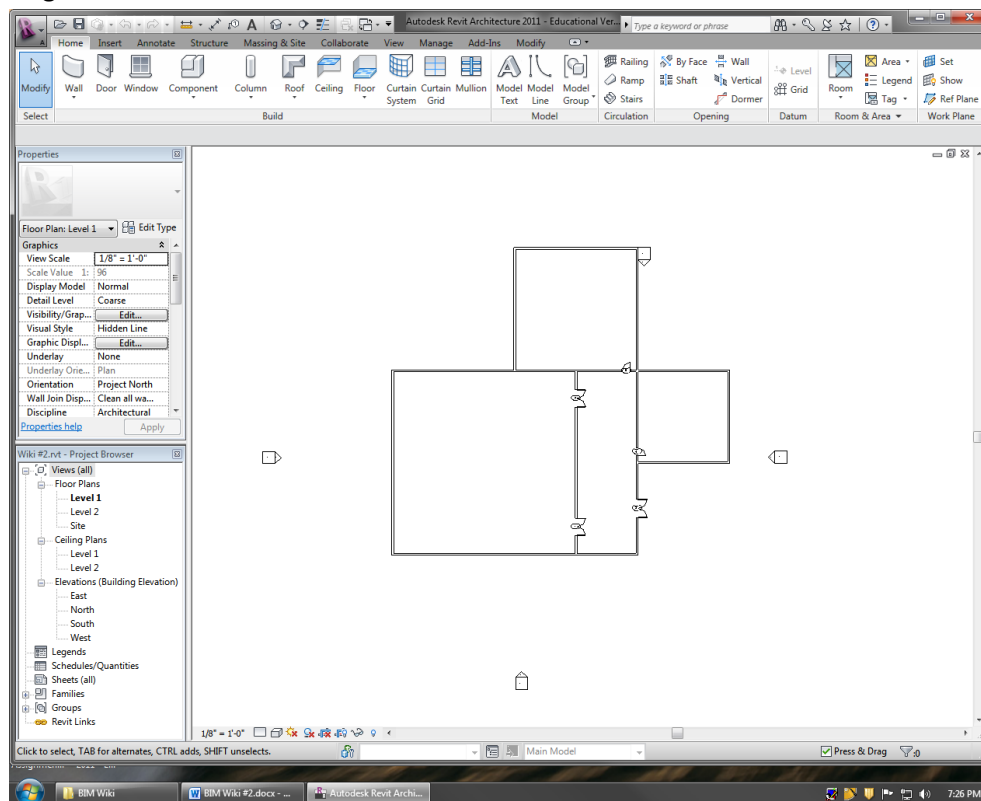
Diagram the process through which Revit can be used to obtain a building's square footage and the process through which this information can be used to create an organized Excel tabulation of the R.S. Means square footage costs associated with a project's design. The Excel file will be formatted to be rapidly updateable, so that multiple iterations of a basic estimate can be performed to keep a running tally of projected project costs.

Note:

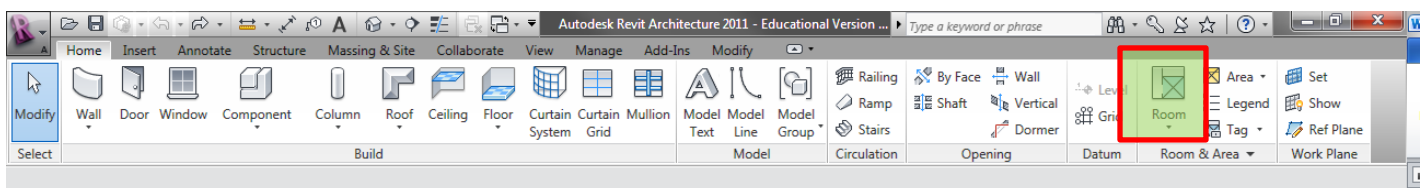
The R.S. Means references in this example will be performed on an elementary school project. You will have to use the appropriate date from the R.S. Means book for your project type. The Revit drawing references in this BIMwiki are entirely fictional, and are a simplified example of how to determine room areas using Autodesk Revit Architecture 2011.

Steps to Determine Building Square Footage:

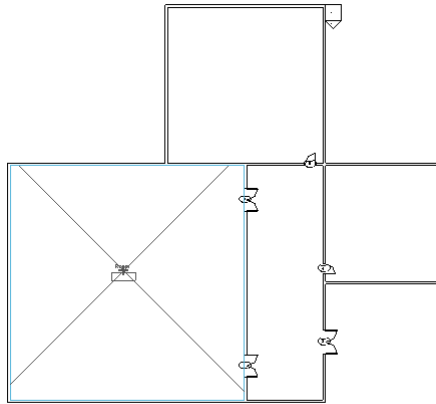
- 1.) Open your building's Revit file.



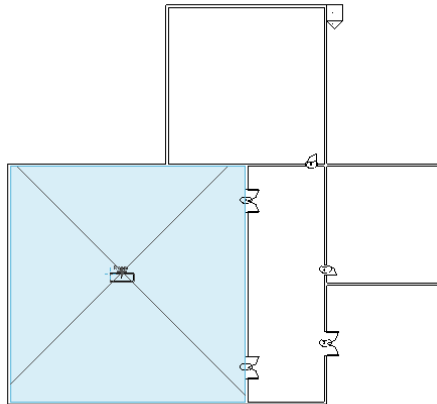
- 2.) Go to the Home Tab in the top right corner, and select the Room tool.



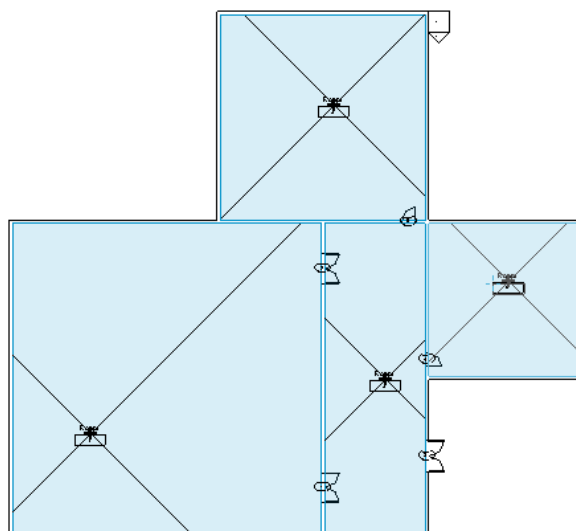
- 3.) Now, when you place your cursor in a room on the model, the Room Tool symbol should appear along with an “X” through the entire room that you wish to select.



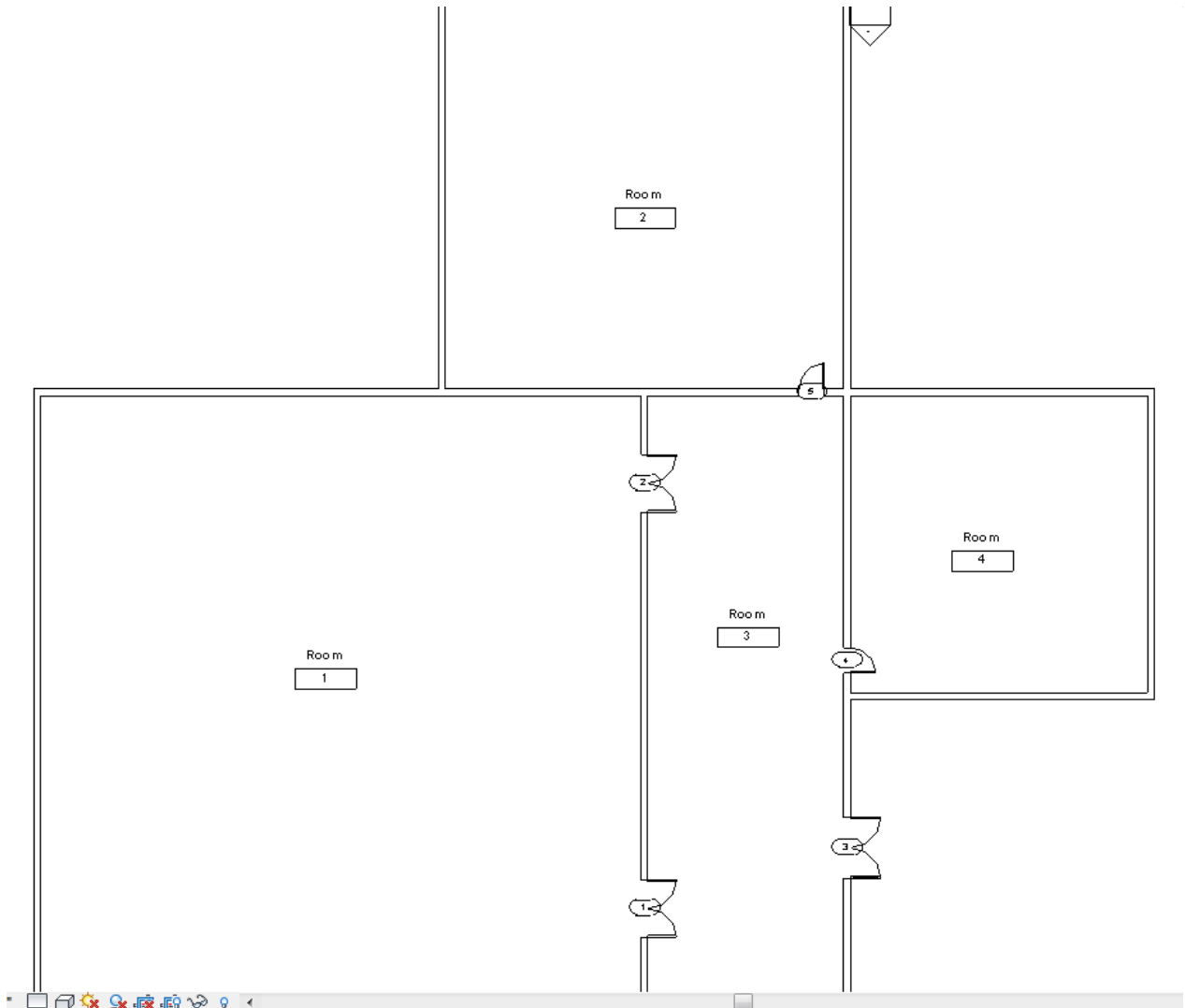
- 4.) Click once to create a room area. The floor in this room should turn a different color.



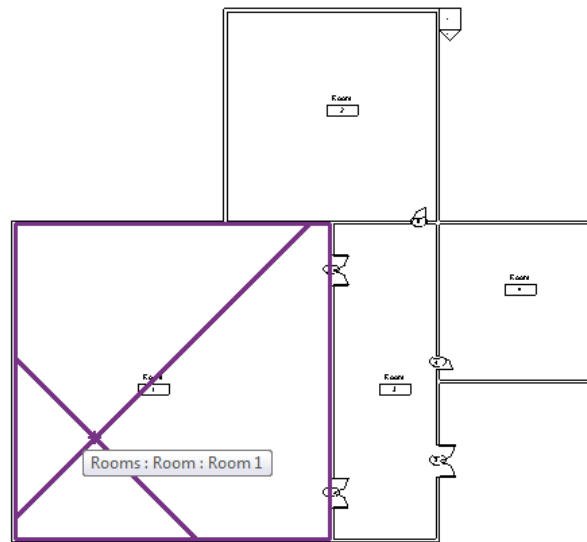
- 5.) Repeat this step for the remaining rooms.



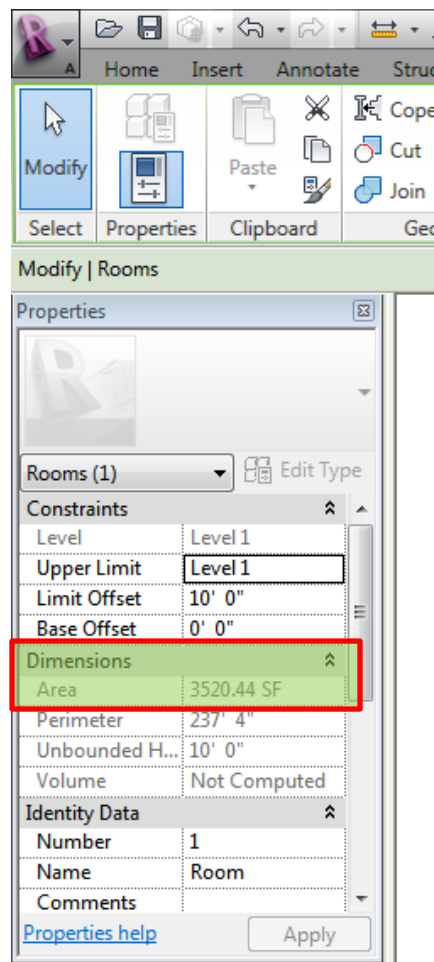
- 6.) Once all of the rooms are highlighted, press “Enter” and the floors in the selected rooms should return to white. A symbol in each of these rooms will designate the room number. The rooms will be number in the order that they were selected.



- 7.) Once the rooms are created, you can mouse over the rooms until the “X” is highlighted. Clicking on this “X” will bring up the room’s properties in the property window.

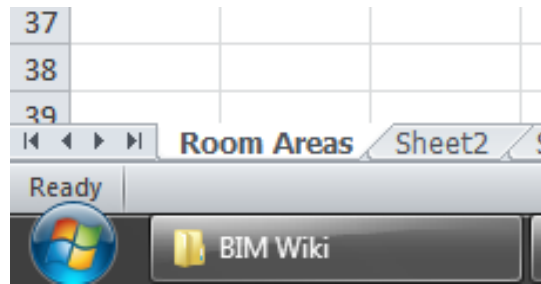


- 8.) Under the “Dimensions” properties, an area value will be visible. These area values will be used in an Excel tabulation to perform the square foot estimate.



Steps to Create an Effective Excel File:

- 1.) Open Microsoft Excel and create a new spreadsheet.
- 2.) Create a Tab named "Room Areas"



- 3.) Create columns and rows for room names and areas. Create a cell for a total room area. Various shading and border techniques can be used to create a more powerful spreadsheet.

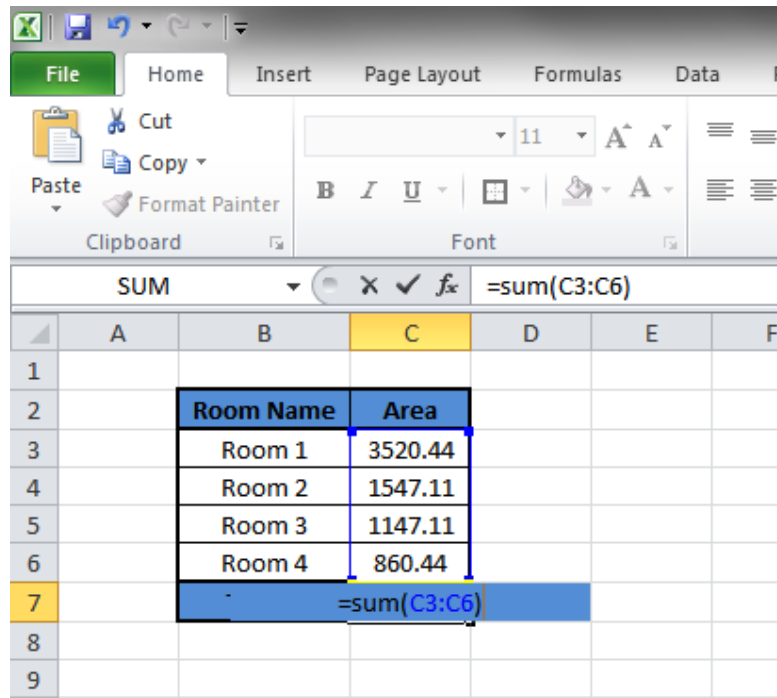
	A	B	C	D
1				
2		Room Name	Area	
3		Room 1		
4		Room 2		
5		Room 3		
6		Room 4		
7		Total Area		
8				
9				
10				
11				

	A	B	C	D
1				
2		Room Name	Area	
3		Room 1		
4		Room 2		
5		Room 3		
6		Room 4		
7		Total Area		
8				
9				
10				

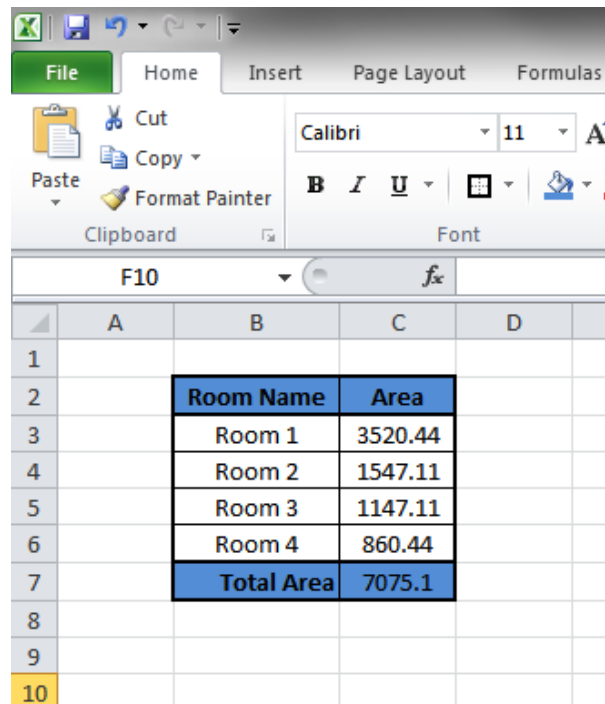
- 4.) Reference back to the Revit file and obtain areas for each of the rooms in your building. In the above example, Room 1 had an area of 3520.44 SF.

	A	B	C	D
1				
2		Room Name	Area	
3		Room 1	3520.44	
4		Room 2	1547.11	
5		Room 3	1147.11	
6		Room 4	860.44	
7		Total Area		
8				
9				
10				
11				

- 5.) To perform a summation in Excel, select the cell that you want to display a total. Type “=sum(” and drag your cursor over the cells you wish to sum. Finish your command by closing the parenthesis.

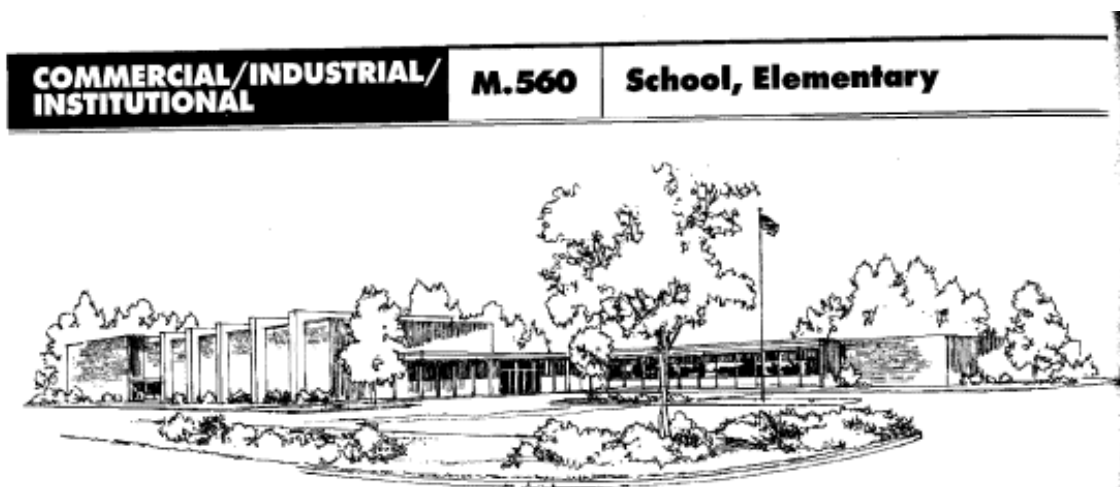


In this example, summing cells C3 through C6 will give a total area of the example building.



Steps to Determine Building Square Foot Costs:

- 1.) Go to the Engineering Library and obtain the latest copy of an R.S. Means Square Foot Costs book.
- 2.) Locate your building type. In this example, we will be using an Elementary School.



Costs per square foot of floor area

Exterior Wall	S.F. Area	25000	30000	35000	40000	45000	50000	55000	60000	65000
	L.F. Perimeter	900	1050	1200	1350	1510	1650	1800	1970	2100
Face Brick with Concrete Block Back-up	Steel Frame	173.50	171.90	170.70	169.80	169.45	168.65	168.20	168.15	167.50
	Bearing Walls	167.10	165.50	164.35	163.45	163.00	162.20	161.80	161.70	161.10
Stucco on Concrete Block	Steel Frame	167.05	165.60	164.60	163.80	163.40	162.75	162.30	162.30	161.75
	Bearing Walls	160.65	159.20	158.15	157.35	157.00	156.30	155.95	155.85	155.30
Decorative Concrete Block	Steel Frame	166.05	164.60	163.60	162.80	162.40	161.70	161.35	161.25	160.75
	Bearing Walls	164.30	162.85	161.85	161.00	160.65	159.90	159.55	159.45	158.95
Perimeter Adj., Add or Deduct	Per 100 L.F.	4.25	3.60	3.10	2.70	2.30	2.10	1.90	1.80	1.60
Story Hgt. Adj., Add or Deduct	Per 1 Ft.	1.60	1.55	1.55	1.55	1.45	1.40	1.50	1.45	1.45
For Basement, add \$30.30 per square foot of basement area										

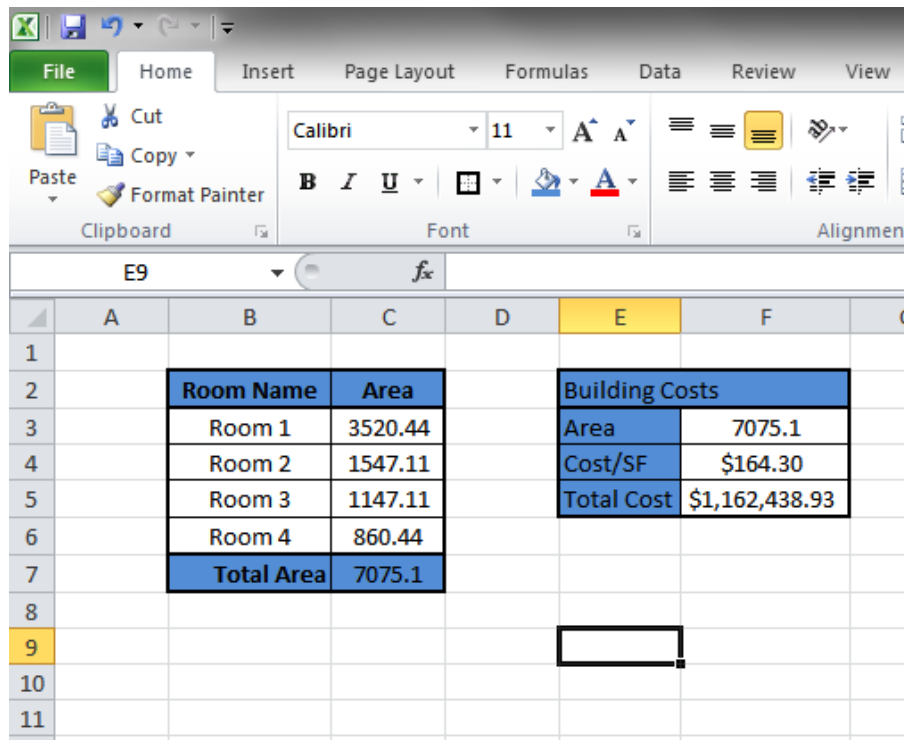
The above costs were calculated using the basic specifications shown on the facing page. These costs should be adjusted where necessary for design alternatives and owner's requirements. Reported completed project costs, for this type of structure, range from \$80.70 to \$205.30 per S.F.

Common additives

Description	Unit	\$ Cost	Description	Unit	\$ Cost
Bleachers, Telescoping, manual			Kitchen Equipment, cont.		
To 15 tier	Seat	128 - 178	Dishwasher, 10-12 racks per hr.	Each	5075
16-20 tier	Seat	264 - 325	Food warmer, counter, 1.2 KW	Each	530
21-30 tier	Seat	280 - 340	Freezer, 44 C.F., reach-in	Each	3275
For power operation, add	Seat	51.50 - 81	Ice cube maker, 50 lb. per day	Each	1825
Cornell's Hardwood	Each	680 - 1525	Range with 1 oven	Each	3275
Clock System			Lockers, Steel, single tier, 60" to 72"	Opening	198 - 325
20 room	Each	16,000	2 tier, 60" to 72" total	Opening	123 - 145
50 room	Each	39,100	5 tier, box lockers	Opening	69 - 82.50
Emergency lighting, 25 watt, battery operated			Locker bench, lamin. maple top only	L.F.	22.50
Lead battery	Each	299	Pedestals, steel pipe	Each	69
Nickel cadmium	Each	785	Seating		
Flagpoles, Complete			Auditorium chair, all veneer	Each	241
Aluminum, 20' high	Each	1550	Veneer back, padded seat	Each	291
40' high	Each	3550	Upholstered, spring seat	Each	280
Fiberglass, 23' high	Each	1775	Classroom, movable chair & desk	Set	74 - 155
39'-5' high	Each	3425	Lecture hall, pedestal type	Each	230 - 685
Kitchen Equipment			Sound System		
Broiler	Each	4050	Amplifier, 250 watts	Each	1875
Cooler, 6 ft. long, reach-in	Each	5275	Speaker, ceiling or wall	Each	198
			Trumpet	Each	380

Important: See the Reference Section for Location Factors.

- 3.) Choose a building type most similar to the one you are planning on using. In this example, there are three types of exterior walls, Face Brick with Concrete Block Backup, Stucco on Concrete Block, or Decorative Concrete Block. There are also two types of structural support; Steel Framing and Bearing Walls.
- 4.) Across the top of the table, there are various square footage values. Choose the column of values closest to your building. For this example, assume the school will be constructed of decorative concrete blocks, and use a bearing wall structural system. The 7075 SF area is closest to the 25000 SF value in the estimate table. See the previous image for the correct square foot cost.
- 5.) Using this value of \$164.30 per SF, return to your excel spreadsheet and create a cost table.



	A	B	C	D	E	F	G
1							
2		Room Name	Area		Building Costs		
3		Room 1	3520.44		Area	7075.1	
4		Room 2	1547.11		Cost/SF	\$164.30	
5		Room 3	1147.11		Total Cost	\$1,162,438.93	
6		Room 4	860.44				
7		Total Area	7075.1				
8							
9							
10							
11							

As you can see, by multiplying the SF cost obtained from R.S. Means by the total square footage of the building, a total cost can be estimated.

- 6.) Various adjustment factors can be applied to your estimate to get a more accurate cost estimate. If your building height is taller than the building height outlined in the SF costs table, there are height adjustment factors that can be applied. If your perimeter is larger or smaller than the amount allotted in the square footage column of the cost data table, other factors can be applied.

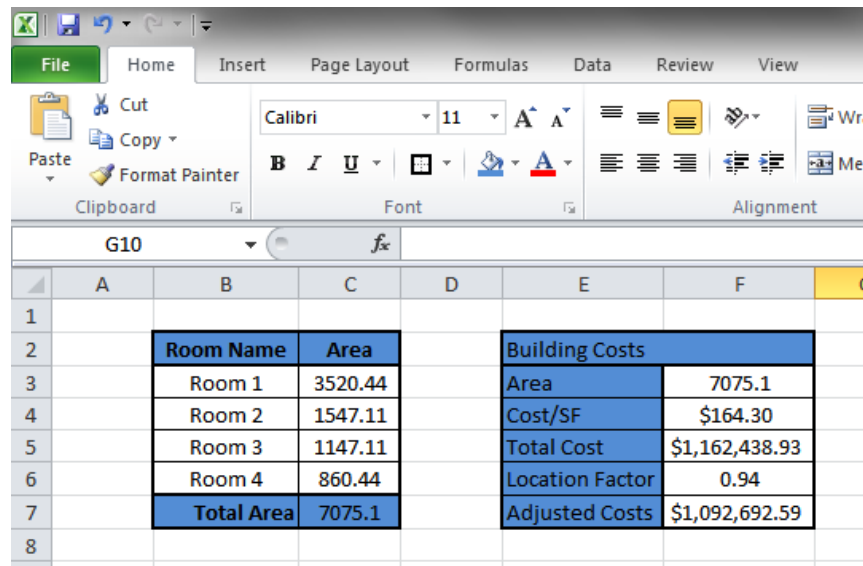
Perimeter Adj., Add or Deduct	Per 100 LF.	4.25
Story Hgt. Adj., Add or Deduct	Per 1 Ft.	1.60
For Basement, add \$ 30.		

In this example, \$4.25 can be added or subtracted for every 100 LF that your building is over or under the 900 LF perimeter allowance included in the 25000 SF column of the table. \$1.60 can be added or subtracted from the \$164.30 per SF cost for every foot your building is over or under the 15' story height outlined for this type of building.

- 7.) These adjustments are sometimes tedious, and may not be necessary for quick cost estimates that are intended to quickly access the overall construction costs of your design thus far.
- 8.) If these adjustments have been performed, and you wish to get an even more accurate cost estimate based on your geographical location, there are Location Factor pages located in the back of the R.S. Means book that can be used to adjust your cost appropriately. In the example below, a location factor of .94 can be used for commercial buildings in the State College area.

PENNSYLVANIA			
150-152	Pittsburgh	1.00	1.01
153	Washington	.95	.98
154	Uniontown	.93	.98
155	Bedford	.90	.95
156	Greensburg	.96	.98
157	Indiana	.93	.97
158	Dubois	.91	.95
159	Johnstown	.91	.96
160	Butler	.93	.96
161	New Castle	.92	.95
162	Kittanning	.94	.97
163	Oil City	.90	.94
164-165	Erie	.94	.94
166	Altoona	.88	.93
167	Bradford	.90	.95
168	State College	.91	.94
169	Wellsboro	.91	.94
170-171	Harrisburg	.94	.96
172	Chambersburg	.89	.93
173-174	York	.92	.95
175-176	Lancaster	.92	.92
177	Williamsport	.84	.87
178	Sunbury	.93	.95
179	Pottsville	.92	.95
180	Lehigh Valley	1.03	1.04
181	Allentown	1.04	1.03
182	Hazleton	.92	.95
183	Stroudsburg	.92	.98
184-185	Scranton	.97	.99
186-187	Wilkes-Barre	.94	.96
188	Montrose	.91	.96
189	Doylestown	1.08	1.07

- 9.) Return to the Excel file and create a row for a location adjustment factor. Multiple your original building cost by this location factor. This gives you an accurate building cost for the State College area.



The screenshot shows an Excel spreadsheet with the following data:

	A	B	C	D	E	F
1						
2		Room Name	Area		Building Costs	
3		Room 1	3520.44		Area	7075.1
4		Room 2	1547.11		Cost/SF	\$164.30
5		Room 3	1147.11		Total Cost	\$1,162,438.93
6		Room 4	860.44		Location Factor	0.94
7		Total Area	7075.1		Adjusted Costs	\$1,092,692.59
8						

This adjusted cost gives a better representation of what your building will cost!

Note: If you'd like to explore what your building would cost if it had been built in previous years, see the R.S. Means Historical Costs PDF pages included with this BIMwiki for directions and tables associated with a historical cost adjustment. Predictions for adjustment factors for upcoming years are available online, and can be utilized using the guide contained in these PDF pages to perform a cost prediction for future construction dates. Additionally, there are many "optional" additives to the basic costs of each building type. See the included R.S. Means Elementary School PDF to see what types of additives can be added to your square foot estimates for elementary buildings. This PDF also includes percentages of building costs for each building component that can be used to divide your estimate into the various trade divisions to produce a project cost breakdown.